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IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF: :

OTOJIRO KIDA ET AL. : GROUP ART UNIT: 1753

NEW CONTINUATION OF  
SERIAL NO: 09/011,749 :

FILED: HEREWITH : EXAMINER: VERSTEEG

FOR: TARGET AND PROCESS FOR ITS  
PRODUCTION, AND METHOD FOR  
FORMING A FILM HAVING A  
HIGHLY REFRACTIVE INDEX

PRELIMINARY AMENDMENT

ASSISTANT COMMISSIONER FOR PATENTS  
WASHINGTON, D.C. 20231

SIR:

Prior to examination on the merits, please amend the application identified above as follows:

IN THE CLAIMS

Please cancel Claims 1-11 without prejudice or disclaimer of the subject matter therein.

Please add new Claims 12-36 as follows:

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- 12. A method for forming a film, the method comprising sputtering a target, wherein
- the sputtering target comprises a substrate and a target material formed on the substrate;
- the target material comprises as the main component an oxygen deficient oxide;
- the oxygen deficient oxide comprises a metal oxide of a chemical formula  $\text{TiO}_x$  that is deficient in oxygen as compared with a stoichiometric composition of the metal oxide; and
- $1 < x < 2$ .
13. The method according to Claim 12, wherein the sputtering is DC sputtering.
14. The method according to Claim 12, wherein the target has a resistivity of at most 10  $\Omega\text{cm}$ .
15. The method according to Claim 12, wherein the target has a resistivity of at most 1  $\Omega\text{cm}$ .
16. The method according to Claim 12, wherein the target further comprises an oxide of at least one metal selected from the group consisting of Cr, Ce, Y, Si, Al and B.
17. The method according to Claim 16, wherein the target contains the oxide of at least one metal in an amount of at most 20 wt%.
18. The method according to Claim 12, wherein the sputtering is carried out in an argon atmosphere or in a mixed atmosphere of argon and oxygen.
19. The method according to Claim 18, wherein the mixed atmosphere of argon and oxygen comprises at most 30 vol% oxygen.
20. The method according to Claim 12, further comprising forming a film having a refractive index of 2.4.

21. A sputtering target comprising  
a substrate;  
a target material formed on the substrate; and  
an undercoat of a metal or alloy between the target material and the substrate, wherein  
the target material comprises as the main component an oxygen deficient oxide;  
the oxygen deficient oxide comprises a metal oxide of a chemical formula  $TiO_x$  that is  
deficient in oxygen as compared with a stoichiometric composition of the metal oxide; and  
 $1 < x < 2$ .

22. The sputtering target according to Claim 21, wherein the undercoat has a thermal  
expansion coefficient between a thermal expansion coefficient of the target material and a  
thermal expansion coefficient of the substrate.

23. The sputtering target according to Claim 21, wherein the undercoat comprises  
a first layer, which is adjacent to the substrate and which has a thermal expansion  
coefficient between the thermal expansion coefficient of the target material and the thermal  
expansion coefficient of the substrate; and

a second layer, which is adjacent to the target material and which has a thermal  
expansion coefficient within a range of  $\pm 2 \times 10^{-6}/^{\circ}C$  of a thermal expansion coefficient of the  
target material.

24. The sputtering target according to Claim 21, wherein the undercoat comprises a  
material selected from the group consisting of Mo, Ti, Ni, Nb, Ta, W, Ni-Al, Ni-Cr,  
Ni-Cr-Al, Ni-Cr-Al-Y and Ni-Co-Cr-Al-Y.

25. The sputtering target according to 21, wherein the undercoat has a thickness of  
from 30 to 100  $\mu m$ .

26. The sputtering target according to Claim 22, wherein the thermal expansion  
coefficient of the undercoat is from  $12 \times 10^{-6}$  to  $15 \times 10^{-6}/^{\circ}C$ .

27. The sputtering target according to Claim 21, wherein the undercoat has a thermal expansion coefficient within a range of  $\pm 2 \times 10^{-6}/^{\circ}\text{C}$  of a thermal expansion coefficient of the target material.

28. The sputtering target according to Claim 27, wherein the thermal expansion coefficient of the undercoat is from  $4 \times 10^{-6}$  to  $11 \times 10^{-6}/^{\circ}\text{C}$ .

29. The sputtering target according to Claim 21, wherein the target material has a thickness of from 2 to 10 nm.

30. The sputtering target according to Claim 21, wherein the target has a resistivity of at most  $10 \Omega\text{cm}$ .

31. The sputtering target according to Claim 21, wherein the target has a resistivity of at most  $1 \Omega\text{cm}$ .

32. The sputtering target according to Claim 21, wherein the target material further comprises an oxide of at least one metal selected from the group consisting of Cr, Ce, Y, Si, Al and B.

33. The sputtering target according to Claim 32, wherein the oxide of at least one metal is contained in an amount of at most 20 wt.%.

34. A method of making a sputtering target, the method comprising  
providing an undercoat on a substrate;  
depositing a target material on the undercoat; and  
forming the sputtering target of Claim 21.

35. The method of Claim 34, wherein the depositing comprises plasma spraying.

36. A method of using a sputtering target, the method comprising sputtering the sputtering target of Claim 21.--

## SUPPORT FOR THE AMENDMENTS

This Preliminary Amendment cancels Claims 1-11; and adds new Claims 12-36.

Support for Claims 12-36 is found in the specification and claims as originally filed. In particular, support for Claim 12 is found in canceled Claims 1 and 11. Support for Claim 13 is found in the specification at page 7, line 5. Support for Claims 14-15 is found in the specification at page 7, lines 8-9. Support for Claim 16 is found in the specification at page 7, lines 23-24. Support for Claim 17 is found in the specification at page 29, Table 6. Support for Claim 18 is found in the specification at page 15, lines 1-2. Support for Claims 19-20 is found in the specification at page 27, Table 5. Support for Claim 21 is found in canceled Claim 1 and the specification at page 11, lines 6-11. Support for Claim 22 is found in the specification at page 11, lines 12-17. Support for Claim 23 is found in the specification at page 11, lines 17-19. Support for Claim 24 is found in the specification at page 12, lines 1-4. Support for Claim 25 is found in the specification at page 12, lines 4-5. Support for Claim 26 is found in the specification at page 12, lines 15-17. Support for Claim 27 is found in the specification at page 11, lines 24-27. Support for Claim 28 is found in the specification at page 12, lines 20-21. Support for Claim 29 is found in the specification at page 13, lines 18-19. Support for Claims 30-31 is found in the specification at page 7, lines 8-9. Support for Claim 32 is found in the specification at page 7, lines 23-24. Support for Claim 33 is found in the specification at page 29, Table 6. Support for Claims 34-35 is found in the specification at least at page 8, line 16, to page 9, line 10. Support for Claim 36 is found in the specification at page 7, line 5. No new matter would be introduced by entry of these amendments.

Upon entry of these amendments, Claims 12-36 will be pending in this application.

Claims 12 and 21 are independent.

REMARKS

Applicants respectfully request entry of the foregoing, and early examination and allowance of the application.

Respectfully submitted,

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